RACOM
RADIO DATA NETWORKS

User manual

RipEX-HS

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Important Notice

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Important Notice

- Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors), or be totally lost. Significant delays or losses of data are rare when wireless devices such as the RipEX-HS are used in an appropriate manner within a well-constructed network. RipEX-HS should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. RACOM accepts no liability for damages of any kind resulting from delays or errors in data transmitted or received using RipEX-HS, or for the failure of RipEX-HS to transmit or receive such data.
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Getting started

RipEX-HS serves as a redundant station equipped with two standard RipEX radio modems using a hot stand by functionality. All you have to do to put it into operation is to connect it to an antenna and a power supply and configure internal RipEX units using a PC and a web browser.

Fig. 1: RipEX-HS

RipEX access defaults: IP 192.168.169.169/24, username: admin, password: admin or **IP 10.9.8.7** when accessing over the optional USB/ETH adapter or Wifi adapter.

When RipEX is assembled in RipEX-HS chassis and Hot standby mode is set, ETH interface of inactive unit is disconnected. The only option to access inactive unit (typically unit “B”) is to use either USB/ETH adapter Wifi adapter and or to press “Unit B” button on the front panel.

Power on the RipEX-HS and wait approx. for 25 seconds for the RipEX OS to boot. When accessing over the optional USB/ETH adapter or Wifi adapter, your PC will get its IP settings from the built-in DHCP server and you have to type https://10.9.8.7 in your browser.

When accessing over Ethernet, set a static IP 192.168.169.x/24 on your PC first, Connect your PC to RipEX “A” ETH interface, start your browser and type https://192.168.169.169 in the address line. When you want to access Unit “B”, press “Unit B” button on the front panel. When you want to access Unit “A” again, press “Unit A” button. Please note that there is a protective timeout of 30 sec.

When accessing RipEX for the first time and using https, you have to accept the https security certificate issued by Racom.

Note

Both RipEX units are in factory default settings with exceptions such as:

- Both units:
  Settings/Device/Hot Standy - set to “On”
- Unit “A”:
  Settings/Device/Hot Standy/MAC – “own”
  Unit name: RipEX A
- Unit “B”:
  Settings/Device/Hot Standy/MAC – the same as in unit “A”

Unit name: RipEX B

Important

You will find the details of the general settings for RipEX units in the RipEX User Manual, and the details for RipEX-HS in Chapter Chapter 4, *Configuration* of the same document.

1. RipEX Hot Standby

1.1. Introduction

RipEX-HS is designed to be used on critical sites, where high stress on HW reliability is required – typically master or repeater stations. It is hot standby, 1+1 redundant, fully monitored, hot swappable equipment.

RipEX-HS is assembled with 2 standard RipEX units, each powered by its independent power supply. Controller takes care of the automatic changeover in case of failure. Changeover conditions are widely configurable. Since both units are hot-stand-by and use identical MAC addresses, an exceptional switch-over time of less than 2s is reached.

LED panels, Mode buttons, HW alarm outputs, SNMP traps and standard RipEX units inside make RipEX-HS configuration and control quite easy and maintenance can be done by anyone familiar with RipEX .

Power can be backed-up using RipEX-HSB battery pack, individual 19" rack 3U box. There are separate batteries for RipEX “A” and “B” power supplies which allows approx. 10 hours of RipEX-HS operation.

1.2. Key Features

- Exceptional switch-over time
  - Less than 2 s
- Standard RipEX units used
  - In case of failure, standard RipEX unit inside can be replaced even on site.
- SW free controller
  - There is no SW in the controller
  - No danger of SW bugs
- Compact dimensions
  - 19" rack 3U box
- Easy to configure and maintain
  - 4 buttons for Operating mode setting
  - LED panels for each internal RipEX unit
  - Standard RipEX web interface
  - All user connectors on rear panel
- Two power supplies
  - Each unit powered by its own independent power supply
  - Each power supply has got its input connector, switch and fuse
  - No single point of failure in terms of power
- Different models for power supply
  - 100–240 VAC 50–60 Hz
  - 36–60 VDC, positive grounding possible
  - 10–30 VDC
- Battery back-up
  - “RipEX-HSB – Battery pack” available for AC power model

  - Separate batteries for RipEX “A” and “B”
  - Batteries are charged-up from RipEX-HS
  - Individual 19" rack 3U box
  - Approx. 10 hours of RipEX-HS operation

- HW alarm outputs
  - 4 HW alarm outputs available on the screw terminal connector on the rear panel
  - Standard RipEX HW alarms of units “A” and “B”
  - Switch HW alarm informs active unit failure and controller switch-over to the back-up unit
  - Power alarm informs controller board power drop-out

- Antenna connections
  - By default one antenna connector connected to active unit
  - Available model with separate “A” and “B” antenna connectors when redundant antennas are used
  - When RipEXes with separated Rx and Tx antenna connectors are used, both respective models are available too

1.3. Standards

Spectrum (art 3.2)	ETSI EN 300 113-2 V1.5.1
	FCC Part 90
EMC (art 3.1.b)	ETSI EN 301 489-1 V1.9.2
	ETSI EN 301 489-5 V1.3.1
Electrical Safety (art 3.1.a)	EN 60950-1:2006
	EN 60950–1:2006/A11:2009, EN 60950–1:2006/A12:2011, EN 60950–1:2006/A1:2010
IP rating	IP40
ETH	IEEE 802.3i
	IEEE 802.3u
	IEEE 802.3af
RS232	EIA-232-F
RS485	EIA RS-485
IEC101	IEC 60870-5-101
IEC104	IEC 60870-5-104
DNP3	IEEE 1815-2010
Profibus DP	IEC 61158 Type 3
SLIP	RFC 1055
VLAN	IEEE 802.1Q

2. RipEX-HS in detail

2.1. Functionality

There are two standard RipEX units with identical configurations inside RipEX-HS. Both units are booted, however only one is active. Interfaces (COM1, COM2, Ethernet, Radio) of the second unit are disconnected.

Note

Even if Rx on inactive RipEX unit LED panel is blinking when the active unit is transmitting, these packets are not received. i.e. they don't take part in Statistic, Neighbours or Graphs.

When the active unit HW alarm output changes to "On" (when a controlled value exceeds the respective threshold), the controller automatically switches all interfaces (COM1, COM2, ETH, ANT–if applicable) to the second unit and it takes over all functions. Since both units are using the same MAC addresses (MAC cloning), there is a minimal drop-out while switching, less than 2 s.

When RipEX units inside RipEX-HS are in Bridge mode, the first switch-over takes approx. 30 sec. It is because hot-stand-by RipEX ARP table is clear and has to be filled with the first packets (forward delay). The next switch-over takes less than 2 sec. When Operating mode is Router, even the first switch-over takes less than 2 sec. When ARP proxy in Router mode is used, switch-over time(s) is equal to that of the Bridge mode.

Possible controlled values by HW alarm output (used for switching between "A" and "B" units) are: RSS, DQ, TXLost[%] – lost packets on Radio channel, Ucc - power voltage, Temp – inside temperature, PWR – RF power, VSWR – reflected RF power, ETH[Rx/Tx], COM1[Rx/Tx], COM2[Rx/Tx] – No of received/transmitted packets on respective interfaces. For recommended settings see chapt. Chapter 4, *Configuration*.

Note

HW alarm output for Temperature is always On. Its thresholds can be Manually set in interval -50 to +90 OC (default -25 to +85 OC). There is also internal control independent on Temperature threshold settings – when temperature of the radio board is higher than 95 OC, HW alarm output is On and is switched to "B" (backup) unit.

SNMP trap with each switch-over can be sent (depending on configuration Settings/Device/Alarm management/HS active) to central SNMP management. When the inactive RipEX HW alarm output is On (controlled Watched value(s) exceeds the respective threshold), the controller never switches to it.

2.2. Block diagram

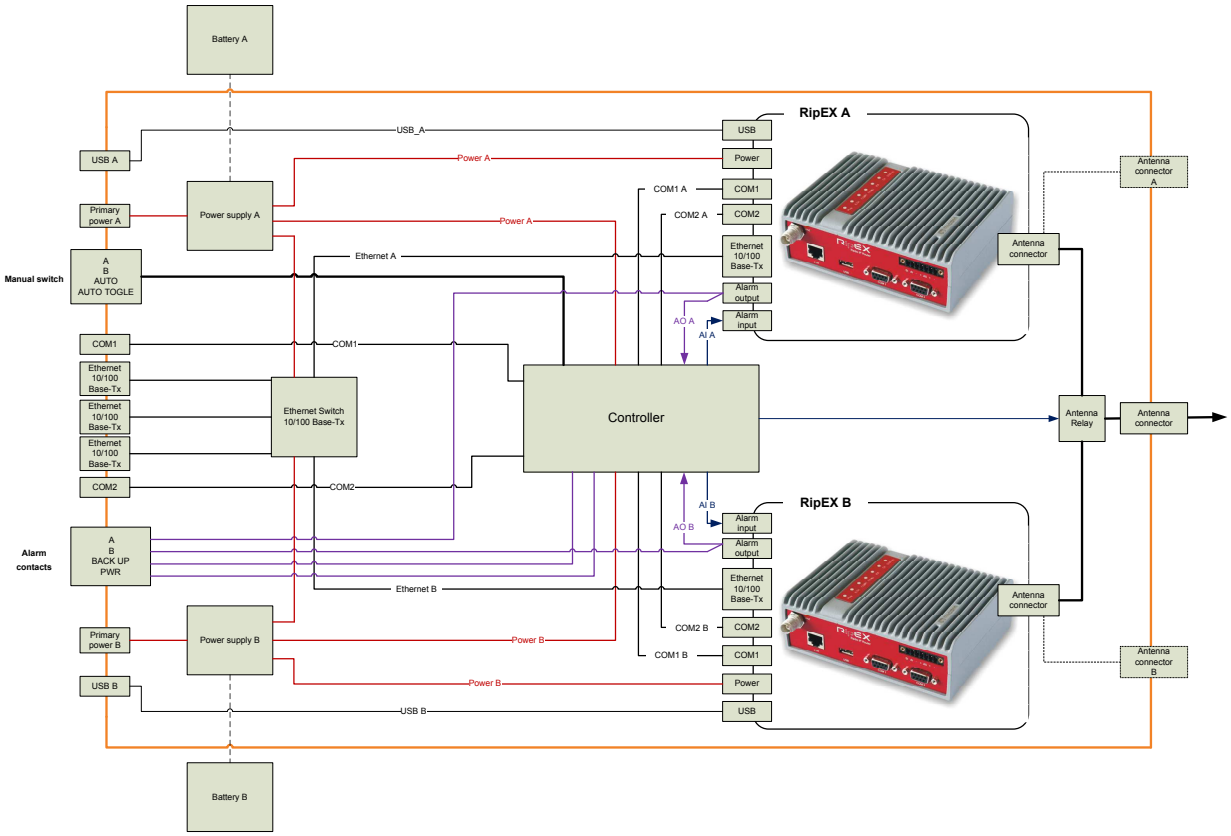


Fig. 2.1: Block diagram

2.3. Operating modes

- **Auto** – primary active is RipEX “A”, when it fails, controller automatically switches-over to RipEX “B”. When both units are with alarms, “A” unit remains active.
- **Auto toggle** – the same as Auto mode, in addition after set time controller automatically switches-over to RipEX “B”, even if “A” doesn't have any alarm and uses “B” for set period in order to confirm, that RipEX “B” is fully ready-to-operate.
- **A** – only RipEX “A” is active and controller will never switch to RipEX “B”
- **B** – only RipEX “B” is active and controller will never switch to RipEX “A”

Auto toggle is the most recommended mode if there are no specific requirements, because unit „B“ functionality is actively and periodically checked.

Auto mode has got minimum number of switch-overs, i.e. minimal possibility of eventual loss of packets in internal RipEX buffers.

A and **B** modes are supposed to be used only for the maintenance/testing and not for normal service.

Note

Auto toggle mode is HW default, i.e. the RipEX-HS is in this mode after power cycle.

2.4. Switching over

In order to achieve maximum reliability, the controller is software free. Switching-over is based only on HW alarm outputs of RipEX units and the HW signals from their power supplies.

The HW alarm of active RipEX or its power supply will cause the immediate and unconditional switch-over to hot-stand-by RipEX. If there are any packets waiting in queues of RipEX which becomes inactive, these packets are discarded after switch-over.

2.4.1. Unit alarm

(=RipEX HW alarm output is “On”) becomes active based on Alarm management settings:
RSS, DQ, TXLost[%] – lost packets on Radio channel, Ucc – power voltage, Temp – inside temperature, PWR – RF power, VSWR – reflected RF power, ETH[Rx/Tx], COM1[Rx/Tx], COM2[Rx/Tx] – No of received/transmitted packets on respective interfaces. For recommended settings see chap. Chapter 4, *Configuration*.

Note

At least 10 data values have to be averaged before checking for a possible alarm. Since different parametres are sampled over different periods, different times are required to obtain correct values:

Ucc, Temp – approx. 10 sec. after booting
PWR, VSWR - approx. 10 sec. after booting and after the first transmission
Others – approx. 200 sec. of respective communication

2.4.2. Power alarm

(=power supply of respective unit is “Off”) when:

- There is no voltage on the input terminals of power supply and battery voltage is lower than 20.5 V DC, where applicable
- There is no voltage on the output terminals of power supply

Some borderline examples for Auto and Auto toggle modes (Primary unit is always “A” in Auto mode, “A” or “B” in Auto toggle mode. The second unit is Stand-by):

1. Power alarm of Primary unit is “On”
   - Stand-by unit becomes active
2. Primary unit alarm is “On” and Power alarm of Stand-by is “On” or Stand-by unit alarm is “On”
   - Nothing will be done. Primary unit remains active
3. Primary unit alarm is “On”, it was switched to Stand-by unit, Primary unit alarm disappeared
   - it will be switched back to Primary unit immediately (the protective timeout of 30 s will be held for shorter HW alarm output changes)

2.4.3. SNMP information about switching

When set (see chap. Section 4.4, “SNMP”), the SNMP trap with the information on the identity of the active unit will be sent by the unit which becomes active (the “Unit name” is inside the trap)

Note

When testing, please wait between each switch-over for at least 30 seconds. A protective timeout of 30 s for the next switch-over will be kept after each change-over.

2.5. RipEX units limitations

When Hot Standy mode in RipEX unit is set, there are some limitations:

1. CD pin on COM1 is used internally, it is not available to the user
2. HW alarm input is used internally, it is not available to the user
3. Save and Sleep modes are not available
4. Alarm limitations:
   Some alarms that cause switch-over from Primary to Stand-by unit remain active. The values are not measured after switch-over, because respective interfaces have been disconnected. These alarms can be manually cleared using a Save button in Diagnostic/Neighbours menu or they will be cleared when the log is automatically saved after its Log save period expired. This limitation is valid for following alarms:
   - RSScom
   - DQcom
   - ETH[Rx/Tx]
   - COM1[Rx/Tx]
   - COM2[Rx/Tx]
5. SNMP - If both SNMP Alarm and HW alarm outputs are set for the same event the SNMP trap will not be sent out. See chap. Section 4.4, “SNMP”.

2.6. HW alarms

In order to achieve maximum reliability, the controller is software free. Switch-over is based only on HW alarm outputs of RipEX units and their power supplies.

3. Product

3.1. Dimensions

19" rack 3U, 482 W × 401 D × 133 H mm, 18.98 W × 15.79 D × 5.24 H inch.

Fig. 3.1: RipeX-HS dimensions

3.2. Front panel

Fig. 3.2: RipEX-HS front panel

3.2.1. Connectors available on front panel

RipEX uses USB 1.1, Host A interface. USB interface is wired as standard:

Connectors USB A, USB B

Tab. 3.1: USB pin description

USB pin	signal	wire
1	+5 V	red
2	Data(−)	white
3	Data (+)	green
4	GND	black

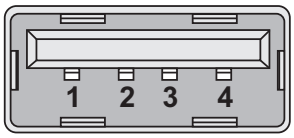


Fig. 3.3: USB connector

The USB interface is designed for connection to the "X5" – external ETH/USB adapter. "X5" is an optional accessory to RipEX, for more see Section 5.3, “Connecting RipEX to a programming PC[1]” - user manual for RipEX. The adapter is used for service access to RipEX’s web configuration interface.

Both USB A and USB B are internally hard-wired to the corresponding RipEX unit.

ETH connector

Standard RJ45 connector 10/100 BaseT Auto MDI/MDIX - connected to the internal ETH switch.

Please note: only active RipEX unit can be accessed using the ETH interface

Tab. 3.2: Connections for the Ethernet to cable connector

PIN	Signal	Direct cable	Crossed cable
1	TX+	orange – white	green – white
2	TX−	orange	green
3	RX+	green – white	orange – white
4	—	blue	blue
5	—	blue – white	blue – white
6	Rx−	green	orange
7	—	brown – white	brown – white
8	—	brown	brown

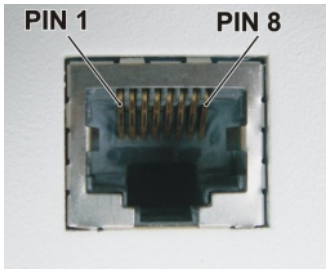


Fig. 3.4: RJ-45F

[1] http://www.racom.eu/eng/products/m/ripex/bench-test.html#connect-PC

3.2.2. LED panels description

Fig. 3.5: A unit LED panel

Tab. 3.3: LED panel description

	Symbol	Description
1	ACT	green – RipEX A is active dark – RipEX A is not active
2	PS	green – input (primary) power supply A is OK (ON) dark – the power supply A is without power or is powered by battery
3	BAT	red – battery voltage is less then 22 V dark – battery disconnected or battery voltage is OK
4	ALARM	red – RipEX is in alarm status dark – no alarms

The lower row of LEDs have the same meaning as the LEDs on RipEX LED panel.

Tab. 3.4: Key to LEDs

	Color	Description
STATUS	Green	RipEX OS (Linux) is running successfully
	Dark	Reset button has been pressed
	Green flashes slowly	reset five-seconds after pressing the Reset button
	Green flashes quickly	default access 15-seconds after pressing the Reset button
	Red	Status alarm
TX	Red	transmitting to radio channel
RX	Green	receiver is synchronised to a packet
	Yellow	there is a signal stronger than −80 dBm on Radio channel
COM2	Green	receiving data
	Yellow	transmitting data
COM1	Green	receiving data
	Yellow	transmitting data
ETH	Yellow ON	100 Mb/s speed
	Yellow OFF	10 Mb/s speed
	Green ON	connected
	Green flashes	ethernet data
PWR	Green	powered successfully
	Blinks with a period of 1 sec	Save mode
	Flashes once per 3 sec	Sleep mode

3.2.3. Buttons

Active when green LED is on:

Auto toggle – the same as Auto mode, in addition after set time controller automatically switches-over to RipEX „B“, even if “A” doesn't have any alarm and uses “B” for set period in order to confirm, that RipEX „B“ is fully ready-to-operate.

Auto – primary active unit is RipEX „A“, and the controller automatically switches-over to RipEX „B“ when “A” fails. When both units fail, unit „A“ remains active.

A – Unit A is active. It will never switch to the B unit. This mode is recommended only for the maintenance/testing use and not for normal service.

B – Unit B is active. It will never switch to the A unit. This mode is recommended only for maintenance/testing use and not for normal service.

For more see chap. Section 2.3, “Operating modes”.

Note

When testing the changeover, please wait at least 30 seconds between individual tests.

3.3. Rear panel

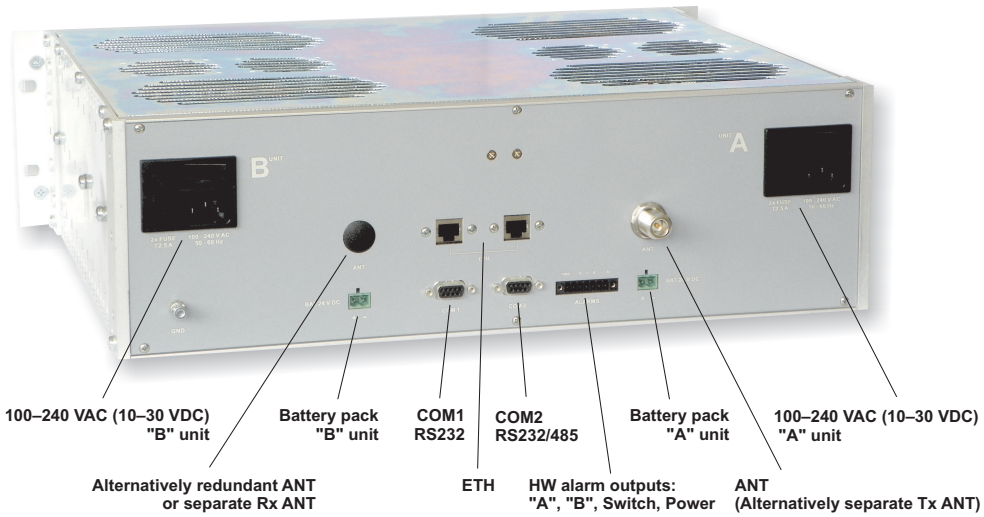


Fig. 3.6: RipEX-HS back panel

3.3.1. Common connectors

ETH connector

2× ETH

Standard RJ45 connector 10/100 BaseT Auto MDI/MDIX - connected to the internal ETH switch.

Tab. 3.5: Connections for the Ethernet to cable connector

PIN	Signal	Direct cable	Crossed cable
1	TX+	orange – white	green – white
2	TX−	orange	green
3	RX+	green – white	orange – white
4	—	blue	blue
5	—	blue – white	blue – white
6	Rx−	green	orange
7	—	brown – white	brown – white
8	—	brown	brown

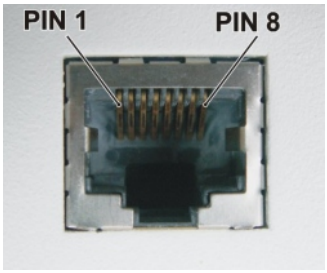


Fig. 3.7: RJ-45F

COM1, COM2

RipEX HS provides two serial interfaces COM1 and COM2 terminated by DSUB9F connectors. COM1 is always RS232, COM2 can be configured as RS232 or RS485.
- both COMs are internally switched to the active RipEX unit.

RipEX‘s RS232 is a hard-wired DCE (Data Communication Equipment) device. Equipment connected to the RipEX’s serial ports should be of DTE (Data Terminal Equipment) type and a straight-through cable should be used. If a DCE device is connected to the serial ports RipEX, a null modem adapter or cross cable has to be used.

Tab. 3.6: COM1,2 pin description

DSUB9F	COM1, 2 – RS232		COM2 – RS485	
pin	signal	In/ Out	signal	In/ Out
1	CD	Out	—	
2	RxD	Out	line B	In/Out
3	TxD	In	line A	In/Out
4	DTR	In	—	
5	GND		GND	
6	DSR	Out	—	
7	RTS	In	—	
8	CTS	Out	—	
9	—	—	—	

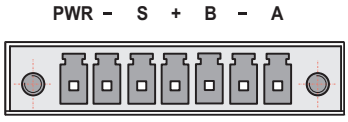
Fig. 3.8: Serial connector

Antenna

There are different models in terms of antenna connectors, see chap. Section 3.5, “Model offerings”. N-female connector is always used.

Fig. 3.9: N connector

Alarms



ALARMS

Fig. 3.10: Alarm connector

This rugged connector connects to Alarms provided by RipEX-HS. A Plug with screw terminals and retaining screws for Alarm connector is supplied with each RipEX_HS. The connector is a Tyco 7 pin terminal block plug, part No. 1776192-7, contact pitch 3.81 mm. It is designed for electric wires with a cross section of 0.5 to 1.5 mm^2. Strip the wire leads to 6 mm (1/4 inch). Isolated cables should receive PKC 108 or less end sleeves before they are inserted in the clip. Insert the cables in the wire ports, tightening securely.

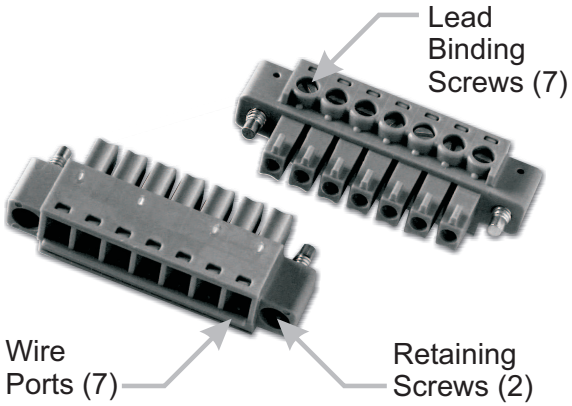


Fig. 3.11: Alarms cable plug

Tab. 3.7: Alarms description

Symbol	Description
A	– alarm status of Ripex A - open collector – internally connected to GND when unit is not in alarm status
B	– alarm status of Ripex B - open collector – internally connected to GND when unit is not in alarm status
–	– connected to ground
+	– connected to +24 V power (max. 5 mA)
S	– open collector - internally connected to GND when unit A is active - i.e. not switched to backup unit
PWR	– internal power alarm - open collector – internally connected to GND when controller power source is OK

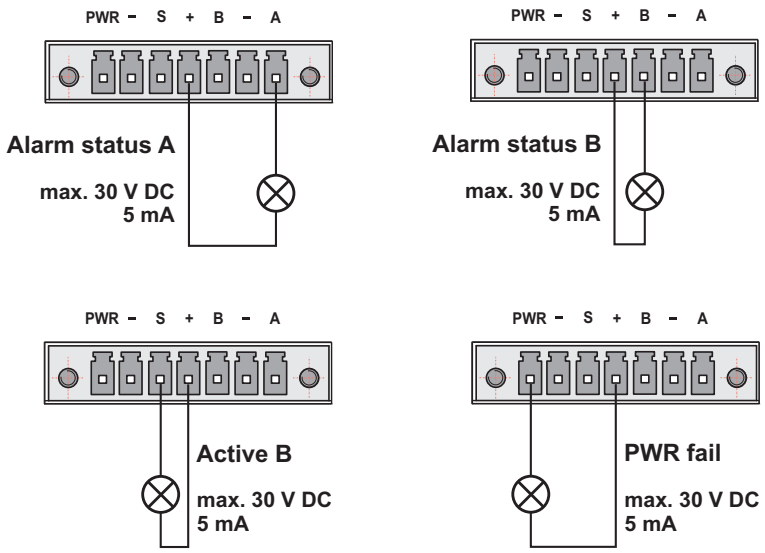


Fig. 3.12: Alarms Outputs

3.3.2. A and B connectors

Power supply connector AC model

100–240 VAC equipped with T2.5A fuse

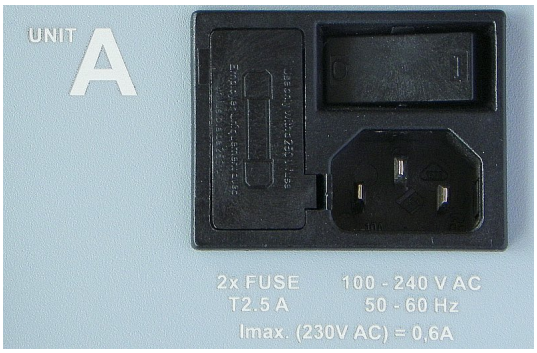


Fig. 3.13: Power supply connector AC model

Battery connector AC model

This rugged connector connects batteries in RipEX-HSB. A Plug with screw terminals and retaining screws for Battery connector is supplied with each RipEX-HS. The connector is a Phoenix contact 2 pin terminal block plug, part No. 1757019, contact pitch 5.08 mm. It is designed for electric wires with a cross section of 0.2 to 2.5 mm2. Strip the wire leads to 7 mm. Isolated cables should receive PKC 2507 or less end sleeves before they are inserted in the clip. Insert the cables in the wire ports, tightening securely.

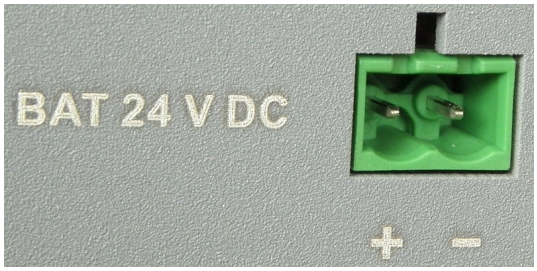


Fig. 3.14: Battery connector

+ to be connected with + pole of 24 V battery
– to be connected with - pole of 24 V battery

Important

internally without a fuse

Power supply connector DC model

Fig. 3.15: Power supply connector DC model

3.4. Technical specifications

Radio parameters			
The same as RipEX units used			
Electrical			
Primary power	HW models:	100–240 VAC, 50–60 Hz	
		36–60 VDC, positive grounding possible	
		10–30 VDC	
	Individual power supply for each RipEX unit		
Interfaces			
Ethernet		3× switched 10/100 Base-T Auto MDI/MDIX	RJ45
COM 1		RS232	DB9F
		300–115 200 bps	
COM 2		RS232/RS485 SW configurable	DB9F
		300–115 200 bps	
USB		2× USB 1.1 for each RipEX unit	Host A
Antenna		50 Ω	N-female(s)
	HW models (according to Antenna)		
	1× N-female – Rx/Tx, switched		
	2× N-female – Rx/Tx, separate for each RipEX unit		
	2× N-female – separate Rx and Tx, switched		
	4× N-female – separate Rx and Tx, separate for each RipEX unit		
Enviromental			
IP Code (Ingress Protection)		IP20	
MTBF (Mean Time Between Failure)		> 500.000 hours (> 50 years)	
Operating temperature		−10 to +60 °C (14 to +140 °F)	
Humidity		5 to 95 % non-condensing	
Storage		−40 to +85 °C (−40 to +185 °F)/5 to 95 % non-condensing	
Mechanical			
Dimensions	19" rack 3U 482 W × 401 D × 133 H mm (18,98 × 15.79 × 5,24 in)		
Weight	7.1 kg (15.7 lbs), RipEX unit exl.		
	9.1 kg (20.1 lbs), RipEX unit incl.		
Diagnostic and Management			
Standard for individual RipEX units used			
LED panels	for each RipEX unit: standard RipEX LED panel (7× tri-color LEDs: Power, ETH, COM1, COM2, Rx, Rx, Status) + 4× two-color LEDs: Active, Power supply, Battery, Alarm		
HW Alarm outputs		RipEX A, RipEX B, Switch, Power	
Approvals			

CE, FCC

3.5. Model offerings

RipEX-HS has been designed to have minimum possible number of hardware variants. Different HW models are determined by power supplies and antenna connections.

3.5.1. Ordering code (Part No's)

Trade name: RipEX-HS

Type: RipEX-HS

Code (according to power supply and antenna connectors): e.g. RipEX-HS-AO, RipEX-HS-DR etc.

RipEX-HS-XY

X – power:

A – 100–240 VAC 50–60 Hz

D – 36–60 VDC, positive grounding possible

E – 10–30 VDC

Y – antenna connectors:

O – 1× N-female - switched for A and B

R – 2× N-female - separate antennas for A and B units (no switching, redundant antennas)

S – 2× N-female - separate antennas for Tx and Rx (switched for A and B units, RipEX-D model used)

F – 4× N-female - separate antennas for Tx and Rx for A and B units (no switching, redundant antennas, RipEX-D model used)

Standard RipEX_HS package contents:

- RipEX-HS (without RipEX units) – 1 pc
- Alarm plug connector (counterpart) – 1 pc
- Rack cage nut + screw – 4 pcs

For AC power model in adition:

- Battery plug connector (counterpart) – 2 pcs

Standard RipEX_HSB package contents:

- RipEX-HSB (without batteries) – 1 pc
- Battery plug connector (counterpart) – 2 pcs
- Rack cage nut + screw – 4 pcs

Note

RipEX units (on separate order) are always assembled in RipEX-HS when delivered from factory, because there would be many uncoupled cables inside, which is not good for transport. In case of failure of one RipEX unit, it is possible to exchange it in the field when necessary.

3.6. Accessories

3.6.1. RipEX-HSB

- Back-up battery pack
- Separate batteries for RipEX “A” and “B”, each unit is supplied independently
- Batteries are charged-up from RipEX-HS (AC power version)
- Individual 19" rack 3U box
- Space for 4x 12 V / 7.2 Ah, FASTON.250 (6.3 mm), e.g. Panasonic LC-R127R2P[2]
- Approx. 10 hours of total RipEX-HS operation, of both RipEX units together

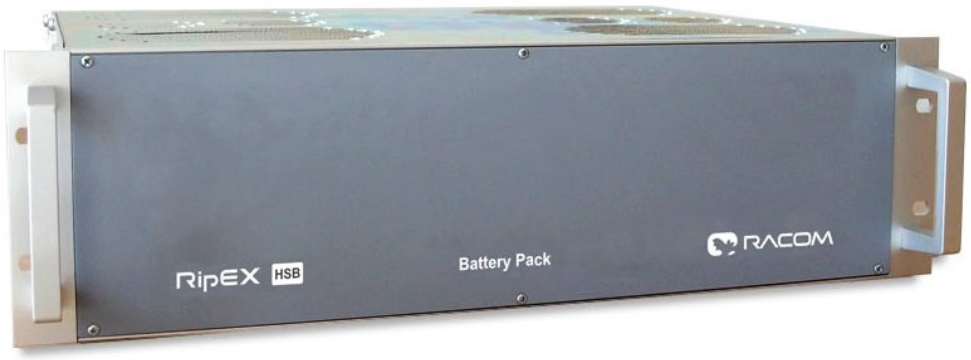


Fig. 3.16: RipEX-HSB

Electrical		
RipEX-HSB		battery pack
		Output 2× 24 V/7.2 Ah
Enviromental		
Operating temperature		−15 to +50 °C (14 to +140 °F)
Humidity		25 to 85 % non-condensing
Storage		−15 to +40 °C (−40 to +185 °F) max. 30 °C recommended, 5 to 95 % non-condensing
Mechanical		
Dimensions	19" rack 3U	482 W × 345 D × 133 H mm (18,98 × 13.58 × 5,24 in)
Weight		3.5 kg (7.7 lbs), batteries exl.
		13.1 kg (28.9 lbs), batteries incl.

[2] http://www.panasonic.com/industrial/includes/pdf/Panasonic_VRLA_LC-R127R2P.pdf

For more information about the operation of Lead Acid batteries, see http://www.panasonic-industrial.com/pf_vrla

Fig. 3.17: RipEX-HSB battery connector

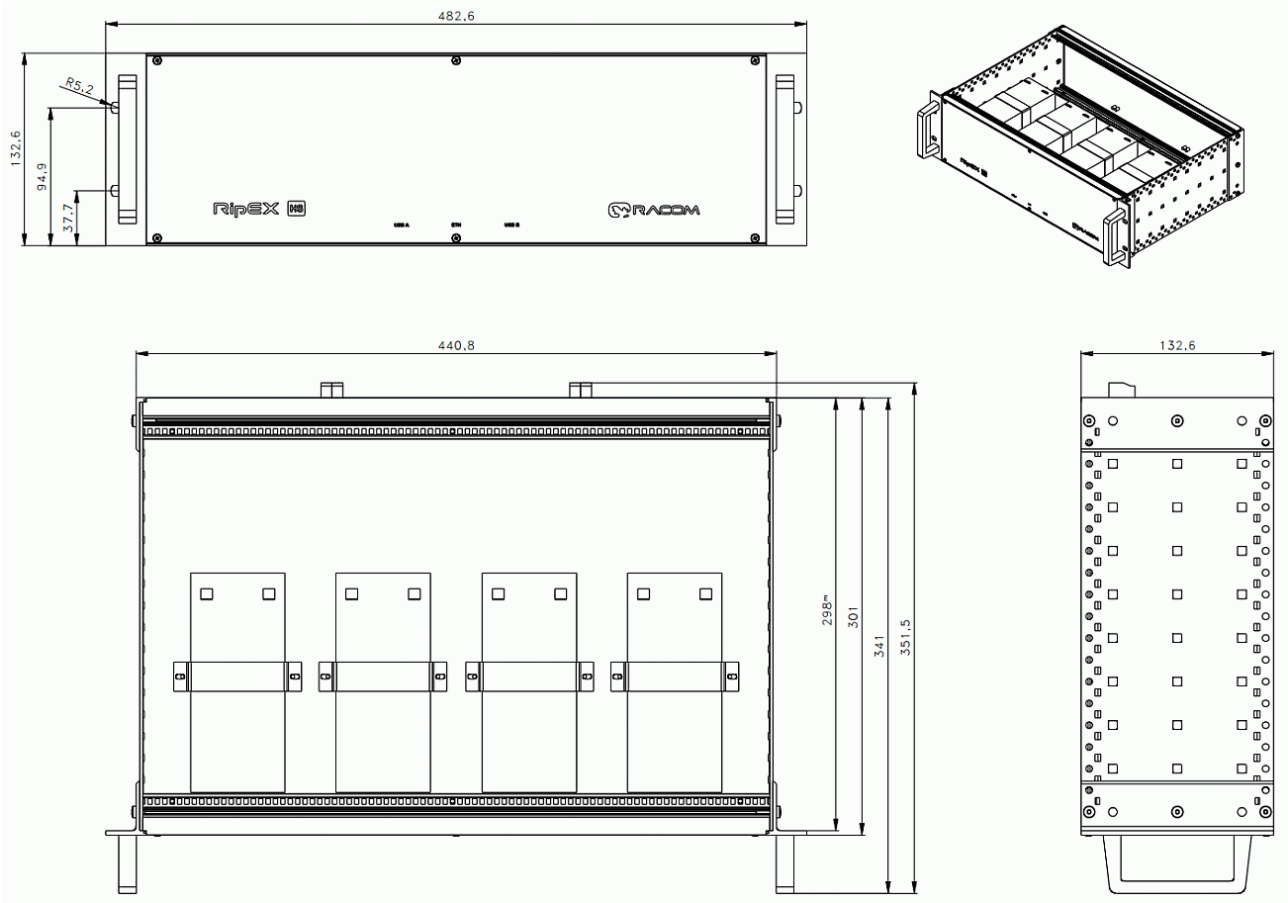


Fig. 3.18: RipeX-HSB dimensions [mm]

3.6.2. X5 - ETH/USB adapter

- For service access to the RipEX web interface via USB connector
- Built-in DHCP server
- To access the RipEX always use the fixed IP 10.9.8.7

For more refer to RipEX User Manual[3].

The USB interface is designed for the connection to the "X5" – external ETH/USB adapter. The "X5" is an optional accessory to RipEX, for more see http://www.ra-com.eu/eng/products/m/ripex/bench-test.html#connect-PC. The adapter is used for service access to RipEX's web configuration interface.

Fig. 3.19: X5 adapter ETH/USB

[3] http://www.racom.eu/eng/products/m/ripex/bench-test.html#connect-PC

4. Configuration

Connection and configuration of the active RipEX unit inside of RipEX-HS is the same as for standard RipEX. Use either X5 - ETH/USB adapter (http://www.racom.eu/eng/products/m/ripex/bench-test.html#connect-PC) or Ethernet interface where RipEX access defaults are: IP 192.168.169.169/24, username: admin, password: admin Inactive RipEX unit can be reached only via X5 adapter.

For more details see chap. Getting started.

The settings of all parameters have to be identical. The only exception is the Unit name - it shall be different and preferably contains A character A for unit A and character B for unit B (e.g. Unit A).

To be sure that the setting of both units are identical it is recommended to set unit A, thereafter save the settings to a file (Maintenance -Configuration - Save to file) and use this setting for unit B (Maintenance -Configuration - Restore - File path - Upload) and change the Unit name.

Note

Be careful to set RipEX units inside of RipEX-HS to their factory defaults. If you do that, both units will have the same Ethernet IP address and their Operating mode is Bridge. While configuring you could be accessing the second unit over the air without being aware of it. In such a case use X5 - ETH/USB adapter.

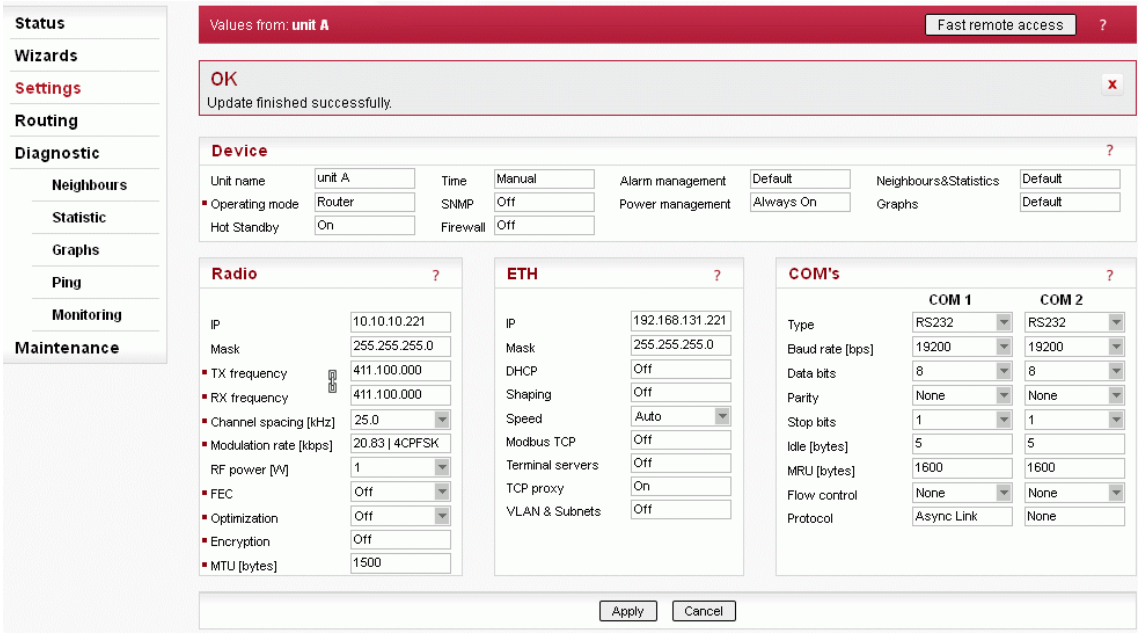


Fig. 4.1: Menu Settings

4.1. Hot-Standby

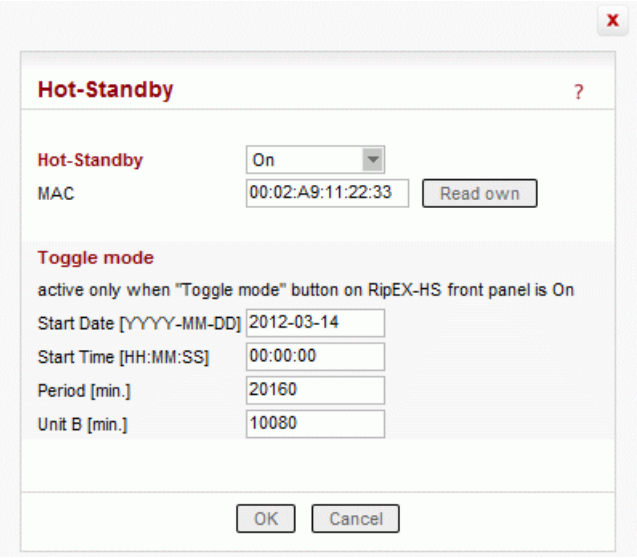


Fig. 4.2: Menu Hot-Stanby

4.1.1. Hot Standby – set to On

When RipEX unit is used in RipEX-HS and Hot Standy is „On“ there are some limitations with it. Specifically, CD pin on COM1 and HW alarm Input and Output are used internally and not available to the user. Neither Save nor Sleep modes can be activated. Please refer RipEX-HS User manual.

All settings below are valid only for RipEX units in RipEX-HS equipment, where two units in Hot Standby mode are running. Both units MUST have the same settings! Only Unit names should be different as this parameter is used in SNMP to recognize the sender of SNMP traps. In order to ensure that the settings of both units are identical, it is recommended to set unit “A”, thereafter save its settings into a file (Maintenance/Configuration/Save to file) and use these settings for unit “B”. (Maintenance/Configuration/Restore/File path/Upload) Finally, a unique Unit name should be assigned to Unit B.
List box: Off, On
Default = Off
When “On”, HW switching from RipEX unit “A” to RipEX unit “B” is performed based on the HW Alarm Output settings in Settings/Alarm management. RipEX “A” is the primary unit, , Unit “B” is activated if there is HW alarm on unit “A” or unit “A” power source is down or when Auto Toggle Period expired. When mentioned events passed, RipEX “A” goes to be active again.

- **MAC**
  Both units in RipEX-HS are using the same MAC addresses (MAC cloning). Whichever unit is active (either “A or B”), RipEX Ethernet interface will use this MAC address. This MAC address has to be unconditionally set to the same value in both units used in RipEX-HS. Otherwise, the switching between units will not function properly.

  Read own – it is possible to download the MAC address of this unit. The value in the second unit has to be manually set to the same value then

- **Auto Toggle mode**
  When Auto Toggle mode is On (HW button on front panel), controller automatically switches-over to RipEX ”B“, even if “A” doesn't have any alarm and uses “B” for a set time in order to confirm that RipEX ”B“ is fully ready-to-operate.

- **Start Date [YYYY-MM-DD]**
  Fill in the Date in the required format when Auto Toggle mode starts.

- **Start Time [HH:MM:SS]**
  Fill in the Time in the required format when Auto Toggle mode starts on ”Start Date“ day.

- **Period [min.]**
  Minimum value 60 min.
  Within this period units “A” and “B” will change their activities over. Unit “A” starts to operate at “Start Date and Time”. When “Period” minus “Unit B” time expires, controller switches to unit “B”.

- **Unit B [min.]**
  Minimum value 5 min.
  Time when unit “B” will be active within “Period”. It has to be shorter than Period by 5 min.

In the example above (Fig. 4.2, “Menu Hot-Stanby”) a toggle will cause changing the active unit once per week (10,080 minutes) at midnight with the first week is starting on the date set above.

4.2. Power management

Set to Always On. Save and Sleep modes are not available when Hot standby.

4.3. Alarm settings

4.3.1. Switch-over alarms

You can set the alarms to cause a switch-over to the hot-stand-by unit.

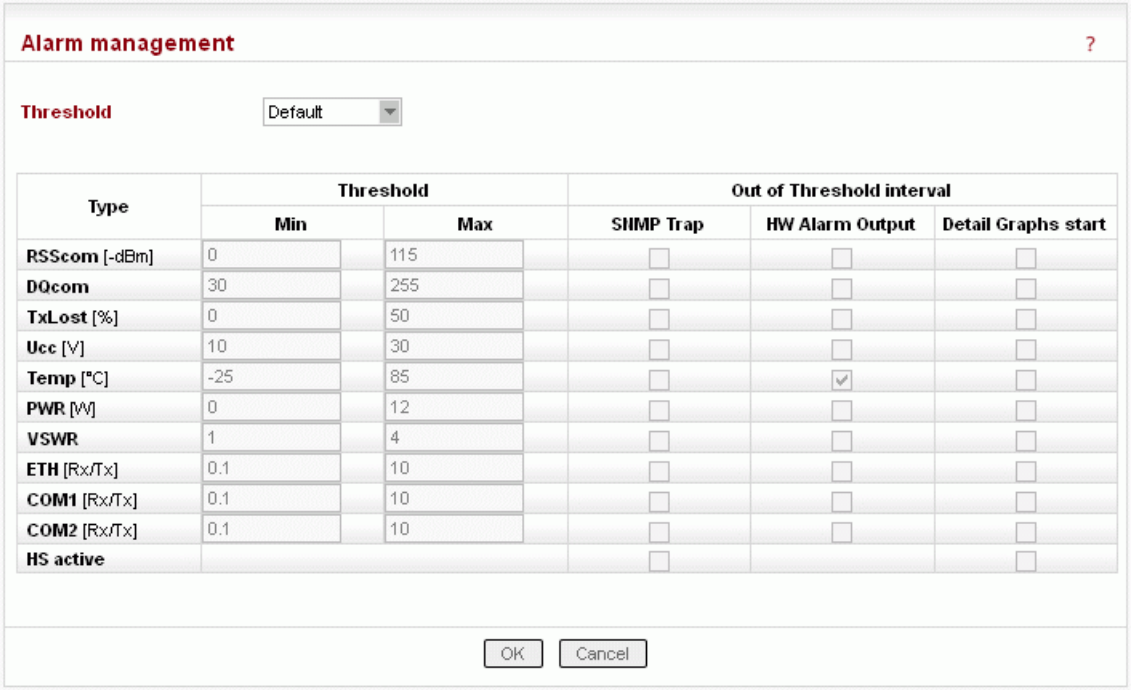


Fig. 4.3: Menu Alarm management

Enabled HW Alarm Output will be used for switching from this active unit to the inactive one, when the specific value is detected outside the Min Value - Max value range alarm will be declared and switching process is started.

Thresholds shall be set according the needs of the actual network:

RSScom Max value shall be set to the designed RSS value plus a designed fade margin (e.g. 80+20 dBm), Min value can be 0 - stronger signal typically will not cause problems.

DQcom more significant communication troubles start with values less than 100; all values above should be sufficient

RSScom and DQcom shall together indicate even partial damage or problem with RipEX unit receiver parts or coaxial feedline cable or antenna. Equally, the problem can be on the transmitter part of RipEX unit, coaxial feedline cable or antenna of transmitter counterpart(s).

TXLost the value will indicate problems with packet deliveries to communicating parties. It is cumulative percentage of lost packet on Radio channel (acknowledge has not been received). Applicable only in Router mode.Exercise caution when setting this alarm. Keep in mind, that problems of counterpart unit(s) can also be reflected here. E.g. counterpart doesn't receive packets or doesn't transmit acknowledges.

Min value shall be set to 0, Max value to tens of % (e.g. 50).

Ucc since power supply for RipEX unit is controlled independently, this alarm is not recommended to be used for switch-over to Standby unit. However it can be used for SNMP trap informing about main power failure and switch to battery back-up. Min value shall be set to lower than 24.5, Max value to the maximal voltage limit for charging the battery (e.g. 29).

Temp the temperature of both RipEX units inside of RipEX-HS will probably be the same, so it doesn't make any sense to use this alarm for switch-over. However this alarm can be used in case of hard duty cycle for switching between both units; Max value in such a case should be set approximately to 65.

PWR this value shall be set to a set value of power with a margin of ± 25-30%. Alarm will be active in case of faulty transmitter part of active RipEX.

VSWR this value mostly indicates problem with antenna or antenna feed line coaxial cable. When RipEX-HS-xO (one antenna switched for A and B units), a switch-over to unit B will probably not help. Recommended values vary between 1 and 3.

ETH[Rx/Tx], COM1[Rx/Tx], COM2[Rx/Tx] these three values represent No of received/transmitted packets on respective interfaces. They are mainly applicable for polling type applications network. Each communication has got one request and one reply, so the number of Rx and Tx packets should then be the same (Rx/Tx=1) . these alarms should not be used For report by exception networks.

4.4. SNMP

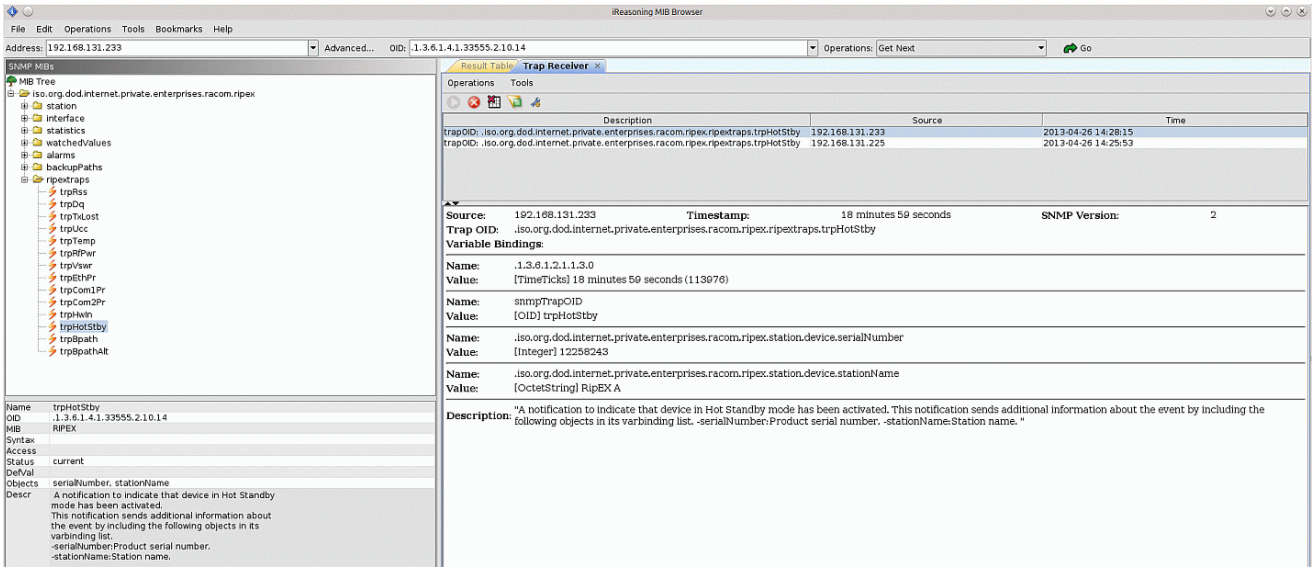
In the same window (Fig. 4.3, "Menu Alarm management") one can set whether a SNMP trap should be sent when respective alarm occurs.

If both SNMP Alarm and HW alarm outputs are set for the same event the switch-over to the second RipEX unit will be carried out and the RipEX with alarm itself has no time for sending the SNMP trap out. Only events set on the Alarm management window and not set as HW alarm Output will be processed.

The SNMP trap message will be sent both when a parameter value exceeds the alarm threshold and when it returns back into its “normal” range.

When SNMP trap information about switch-over to hot-stand-by RipEX unit is required, tick HS active SNMP alarm.

For more information about SNMP settings refer to RipEX User manual http://www.racom.eu/download/hw/ripex/free/eng/ripex-m-en.pdf



Note

Since the units have got the same configurations (same IP addresses), the unique identifier in SNMP trap is the “Unit name” (menu Settings/Device). It is recommended to set different names for A and B units (default RipEX A and RipEX B).

5. Installation

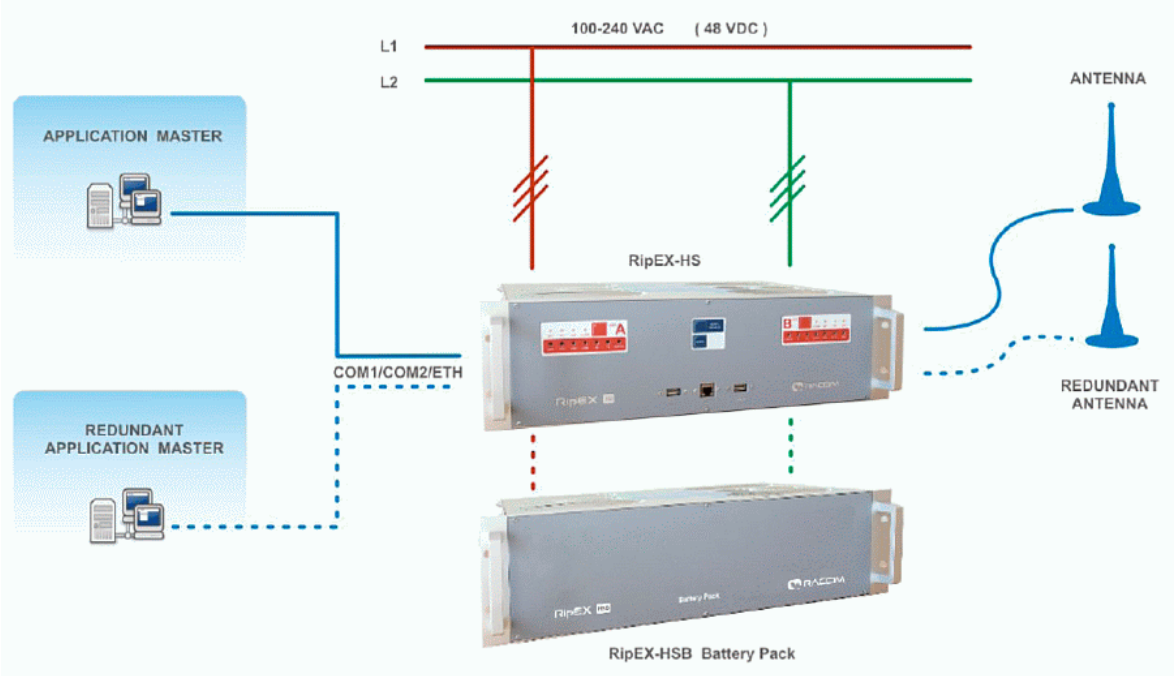


Fig. 5.1: HS connected as a SCADA centre redundant radio modem

Both serial and Ethernet SCADA masters are supported.

5.1. Mounting

Fig. 5.2: RipeX-HS dimensions [mm]

Fig. 5.3: RipeX-HS in 19" Rack Cabinet

Fig. 5.4: RipeX-HS montage using Assembly kit M6 – 4 pcs

5.2. Power

5.2.1. 100–240 V AC, 50–60 Hz

Since there are two independent power supplies, one for each RipEX unit, it is recommended to connect each power supply to a separate power phase with individual circuit breakers. When one phase would be off, RipEX-HS will still be On.

There are individual power connectors for each power supply. See chap. Section 3.3.2, “A and B connectors”.

5.2.2. 36–60 V DC

There are also two independent power supplies with 36 to 60 V DC input voltage, one for each RipEX unit; input conductors are isolated from the rest of the RipEX-HS and thus allows positive or negative grounding. The electric strength is 4 kV AC/1 min.

Note

When positive grounding is used, neither device connected via RS232, USB, ETH can have negative grounding !

There are individual power connectors for each power supply. See chap. Section 3.3.2, “A and B connectors”.

5.2.3. 10–30 V DC

There is not any internal power supply in this option, powering is the same as for standard RipEX.

The supply must be capable of providing the required input for the projected RF output. The power supply must be sufficiently stable so that voltage does not drop when switching from receive to transmit, which takes less than 1.5 ms. To avoid radio channel interference, power supply must meet all relevant EMC standards. Never install a power supply close to the antenna. Maximal supply cable length is 3 m, and recommended wire cross section 1.0 mm^2.

5.2.4. Back-up

When back-up battery is required, RipEX-HSB battery pack can be connected. RipEX-HSB is individual 19" rack 3U box assembled with separate batteries for RipEX “A” and “B”. There is space for 4x 12 V / 7.2 Ah batteries inside. Batteries are charged-up from RipEX-HS. RipEX-HSB provide approx. **10 hours** of total RipEX-HS operation.

Generally not only RipEX-HSB, but any battery, even with higher capacity, can be used. PSC-100B power supply is used in RipEX-HS. http://www.meanwell.com/search/psc-100/default.htm Its battery charger output is 27,6 V/1,25 A. So battery charge time is equal to max. charge current.

Note

Primary AC power has to be active first, otherwise the battery back-up will not be working.

5.3. Grounding

The grounding screw on the rear panel has to be properly connected to the grounding point of the rack. The minimal required copper conductor cross-section is 4 mm^2.

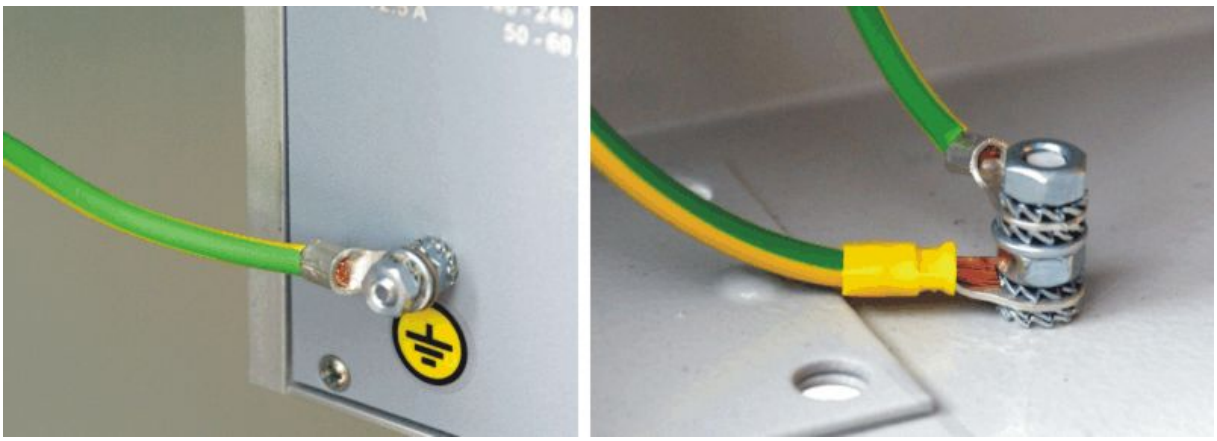


Fig. 5.5: RipeX-HS grounding in a cabinet

5.4. Antenna

For antenna installation refer to RipEX User manual – http://www.racom.eu/eng/products/m/ripex/instal.html#antenna-mount

6. Troubleshooting

For trouble with individual RipEX units please refer to RipEX User Manual Chap. 9. Troubleshooting

1. The switch-over works, but the Eth connection starts working with some delay

   - Check if MAC addresses are really identical for both active and inactive units

2. Automatic switch-over does not take place:

   - Make sure that A or B mode is not used, Auto or Auto Toggle mode has to be used.

3. The switch-over takes place due to problems with powering but not if a problem with RipEX unit occurs

   - check the setting of alarms and thresholds for both RipEX units with focus to the specific problem

4. The switch-over takes place even if it is not required

   - check the Diagnostic part of Status menu, eventually Graphs, check if the thresholds and alarms used are in accordance with type of network used - for details see chap. Section 4.3, “Alarm settings”.

7. Safety, environment, licensing

7.1. Frequency

The radio modem must be operated only in accordance with the valid frequency license issued by national frequency authority and all radio parametres have to be set exactly as listed.

Important

Use of frequencies between 406.0 and 406.1 MHz is worldwide-allocated only for International Satellite Search and Rescue System. These frequencies are used for distress beacons and are incessantly monitored by the ground and satellite Cospas-Sarsat system. Other use of these frequencies is forbidden.

7.2. Safety distance

Safety distances with respect to the US health limits of the electromagnetic field intensity are in Minimum Safety Distance tables below, calculated for different antennas and RipEX power levels. The distances were calculated according to (doplnit normu) and apply to far-field region only. Whenever the result is comparable or smaller than the actual size of the respective antenna, the field intensity is even smaller than the far-field based calculation and the safety limit is never exceeded. For output power 0.2 W or lower the safety limit is not exceeded at any distance and any of the antennas.

Tab. 7.1: Worst case Minimum Safety Distance

	Antenna Gain		
	5 dBi	10 dBi	15 dBi
160 MHz	2 m	3 m	5 m
300 and 400 MHz	2 m	2 m	4 m

For detailed Minimum Safety Distances refer to RipEX User Manual ???odkaz

7.3. Electric power shock hazard

BEFORE uncovering the RipEX HS top cover be sure that the power plug is disconnected. It is not allowed to use the RipEX HS without the cover because of the risk of electric power shock!

7.4. High temperature

When opening of top cover in an environment where the ambient temperature exceeds 55 °C, prevent human contact with the enclosure heatsink of the RipEXes units.

7.5. RoHS and WEEE compliance

The RipEX is fully compliant with the European Commission"s RoHS (Restriction of Certain Hazardous Substances in Electrical and Electronic Equipment) and WEEE (Waste Electrical and Electronic Equipment) environmental directives.

RoHS Restriction of hazardous substances (RoHS)

The RoHS Directive prohibits the sale in the European Union of electronic equipment containing these hazardous substances: lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), and polybrominated diphenyl ethers (PBDEs).

End-of-life recycling programme (WEEE)

The WEEE Directive concerns the recovery, reuse, and recycling of electronic and electrical equipment. Under the Directive, used equipment must be marked, collected separately, and disposed of properly. Racom has instigated a programme to manage the reuse, recycling, and recovery of waste in an environmentally safe manner using processes that comply with the WEEE Directive (EU Waste Electrical and Electronic Equipment 2002/96/EC).

Battery Disposal—This product may contain a battery. Batteries must be disposed of properly, and may not be disposed of as unsorted municipal waste in the European Union. See the product documentation for specific battery information. Batteries are marked with a symbol, which may include lettering to indicate cadmium (Cd), lead (Pb), or mercury (Hg). For proper recycling return the battery to your supplier or to a designated collection point. For more information see: www.weeerohsinfo.com

7.6. Conditions of Liability for Defects and Instructions for Safe Operation of Equipment

Please read these safety instructions carefully before using the product:

- Liability for defects does not apply to any product that has been used in a manner which conflicts with the instructions contained in this operator manual, or if the case in which the radio modem is located has been opened, or if the equipment has been tampered with.
- The radio equipment can only be operated on frequencies stipulated by the body authorised by the radio operation administration in the respective country and cannot exceed the maximum permitted output power. RACOM is not responsible for products used in an unauthorised way.
- Equipment mentioned in this operator manual may only be used in accordance with instructions contained in this manual. Error-free and safe operation of this equipment is only guaranteed if this equipment is transported, stored, operated and controlled in the proper manner. The same applies to equipment maintenance.
- In order to prevent damage to the radio modem and other terminal equipment the supply must always be disconnected upon connecting or disconnecting the cable to the radio modem data interface. It is necessary to ensure that connected equipment has been grounded to the same potential.
- Only undermentioned manufacturer is entitled to repair any devices.

7.7. Important Notifications

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7.8. Product Conformity

RACOM declares that the RipEX radio modem & router is in conformity with the essential requirements and other relevant requirements of the Directive of the European Parliament and of the Council 1999/5/EC on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

The RipEX radio modem & router has been type accepted for operation by the Federal Communications Commission in accordance with Title 47 Part90 of the FCC rules. See the label on the unit for the specific FCC ID and any other certification designations.

7.9. Country of Origin

RACOM
RADIO DATA NETWORKS

Country of Origin Declaration

Manufacturer:	**RACOM**
Address:	**Mirova 1283, 592 31 Nove Mesto na Morave, Czech Republic**
VAT No:	**CZ46343423**

We, the manufacturer, hereby declare that Country of Origin of the RAy microwave links and its accessories is the Czech Republic, EU.

Part Number	Description
RipEX-160	Radio modem, Bridge, 42kbps, ETH, COM1, 5W
RipEX-300	Radio modem, Bridge, 42kbps, ETH, COM1, 5W
RipEX-400	Radio modem, Bridge, 42kbps, ETH, COM1, 5W
RipEX-HS	19" Hot standby chassis,RipEX units excl.,pow.supplies incl.
RipEX-HSB	19" Battery pack chassis for RipEX-HS, batteries excl.
RipEX_DEMO_CASE	Demo case (without radio modems)
RipEX_D_RACK_230	19" rack shelf – double, incl. 2x PS 100-256 VAC / 24 VDC
RipEX_D_RACK_48	19" rack shelf – double, incl. 2x PS 48 VDC / 24 VDC
RipEX_DUMMYLOAD	Dummy load antenna
RipEX_FAN_KIT	Fan kit, for external cooling
RipEX_F_BRACKET	Flat-bracket, for flat mounting
RipEX_L_BRACKET	L-bracket, for vertical mounting
RipEX_S_RACK_MS	19" rack shelf – single, incl. MS2000/12 + AKU 7.2Ah
RipEX_S_RACK_230	19" rack shelf – single, incl. PS 100-256 VAC / 24 VDC
RipEX_S_RACK_48	19" rack shelf – single, incl. PS 48 VDC / 24 VDC

Nove Mesto na Morave, 1 of March 2014
Jiri Hruska, CEO

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www.racom.eu

Fig. 7.1: Country of Origin declaration for RipEX

7.10. Warranty

RACOM-supplied parts or equipment ("equipment") is covered by warranty for inherently faulty parts and workmanship for a warranty period as stated in the delivery documentation from the date of dispatch to the customer. The warranty does not cover custom modifications to software. During the warranty period RACOM shall, on its option, fit, repair or replace ("service") faulty equipment, always provided that malfunction has occurred during normal use, not due to improper use, whether deliberate or accidental, such as attempted repair or modification by any unauthorised person; nor due to the action of abnormal or extreme environmental conditions such as overvoltage, liquid immersion or lightning strike.

Any equipment subject to repair under warranty must be returned by prepaid freight to RACOM direct. The serviced equipment shall be returned by RACOM to the customer by prepaid freight. If circumstances do not permit the equipment to be returned to RACOM, then the customer is liable and agrees to reimburse RACOM for expenses incurred by RACOM during servicing the equipment on site. When equipment does not qualify for servicing under warranty, RACOM shall charge the customer and be reimbursed for costs incurred for parts and labour at prevailing rates.

This warranty agreement represents the full extent of the warranty cover provided by RACOM to the customer, as an agreement freely entered into by both parties.

RACOM warrants the equipment to function as described, without guaranteeing it as befitting customer intent or purpose. Under no circumstances shall RACOM's liability extend beyond the above, nor shall RACOM, its principals, servants or agents be liable for any consequential loss or damage caused directly or indirectly through the use, misuse, function or malfunction of the equipment, always subject to such statutory protection as may explicitly and unavoidably apply hereto.

Appendix A. Abbreviations

CLI	Command Line Interface
CTS	Clear To Send
DCE	Data Communication Equipment
DQ	Data Quality
DTE	Data Terminal Equipment
EMC	Electro-Magnetic Compatibility
FCC	Federal Communications Commission
FEP	Front End Processor
GPL	General Public License
https	Hypertext Transfer Protocol Secure
IP	Internet Protocol
kbps	kilobit per second
LAN	Local Area Network
MAC	Media Access Control
MDIX	Medium dependent interface crossover
MIB	Management Information Base
NMS	Network Management System
N.C.	Normally Closed
N.O.	Normally Open
OS	Operation System
PC	Personal Computer
PER	Packet Error Rate
PWR	Power
RF	Radio Frequency
RipEX	Radio IP Exchanger
RoHS	Restriction of the use of Hazardeous Substances
RSS	Received Signal Strength
RTS	Request To Send
RTU	Remote Terminal Unit
RX	Receiver
SCADA	Supervisory control and data acquisition
SDR	Software Defined Radio
SNMP	Simple Network Management Protocol
TCP	Transmission Control Protocol
TX	Transmitter
UDP	User Datagram Protocol
VSWR	Voltage Standing Wave Ratio
WEEE	Waste Electrical and Electronic Equipment

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Appendix B. Revision History

Revision
This manual was prepared to cover a specific version of firmware code. Accordingly, some screens and features may differ from the actual unit you are working with. While every reasonable effort has been made to ensure the accuracy of this publication, product improvements may also result in minor differences between the manual and the product shipped to you.

Revision 1.0 2012-07-31
First issue

Revision 1.1 2012-08-01
Added information about battery connectors and technical specifications

Revision 1.2 2013-04-10
Added information about new HW model, 10–30V DC power

Revision 1.3 2014-02-24
Added information on the possibility use the Wifi adapter

Revision 1.4 2014-03-26
Added information about Country of Origin
Added chapter: Country of Origin